Oct. 16, 1934. R. S. McCLEERY 1,977,285

METHOD OF ROLLING METAL SECTIONS IN MULTIPLE

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Fig. 1

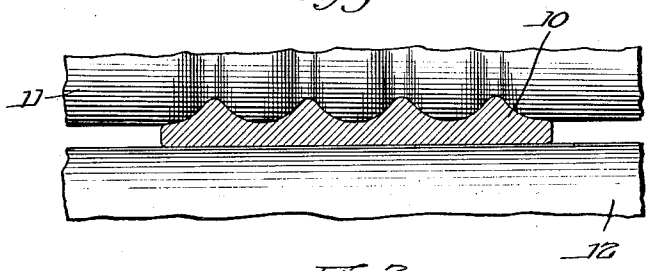


Fig. 2.

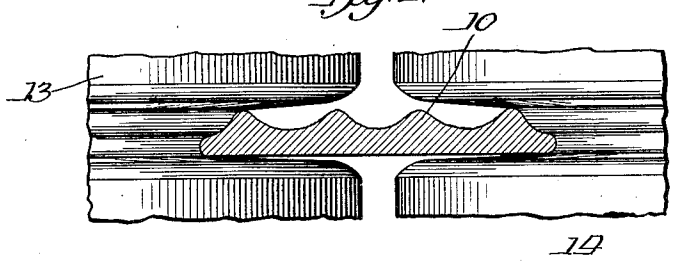


Fig. 3.

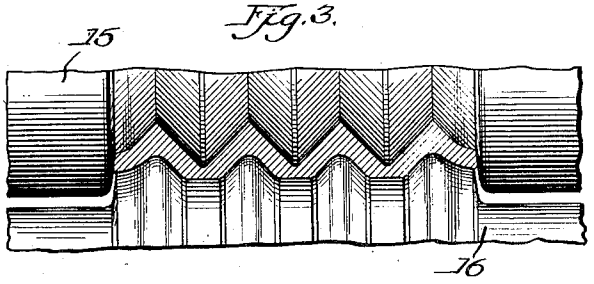


Fig. 4

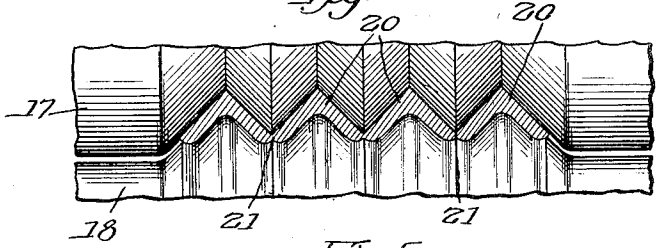
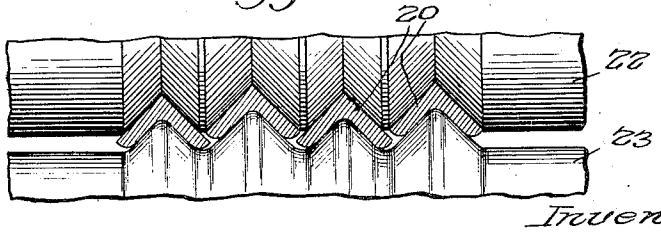


Fig. 5.



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METHOD OF ROLLING METAL SECTIONS IN MULTIPLE

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Fig. 6

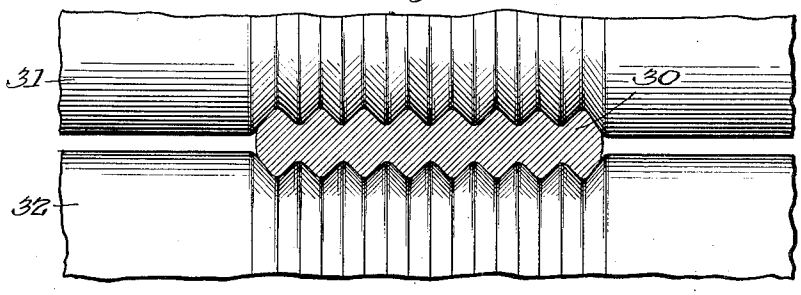


Fig. 7

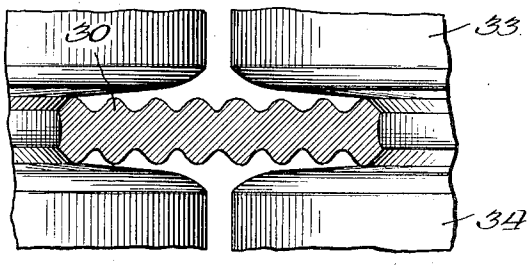


Fig. 8

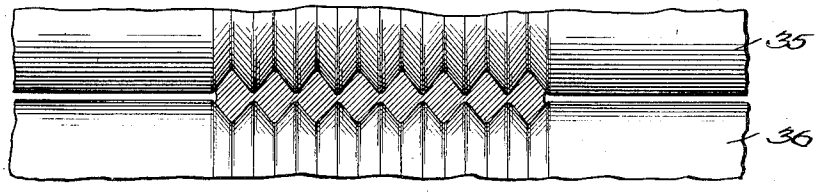


Fig. 9.

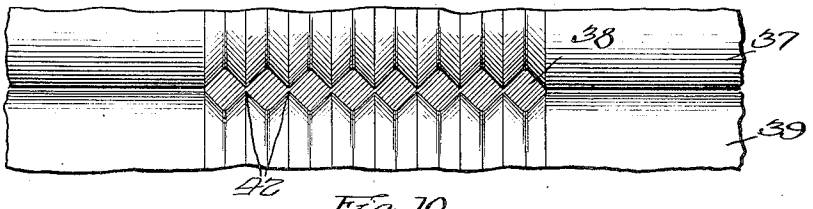
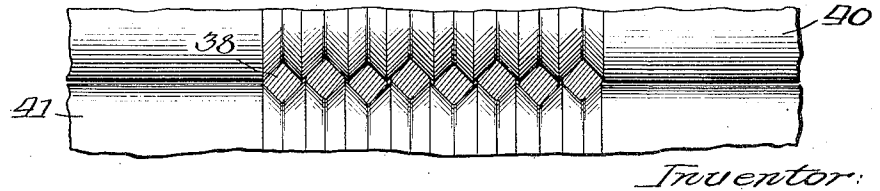


Fig. 10



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METHOD OF ROLLING METAL SECTIONS IN MULTIPLE

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Fig. 11

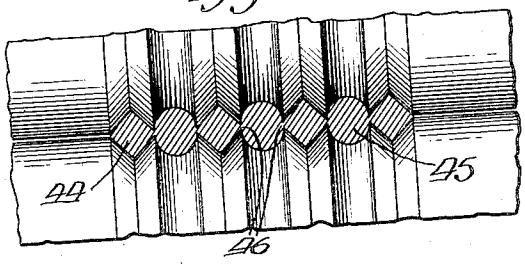


Fig. 12

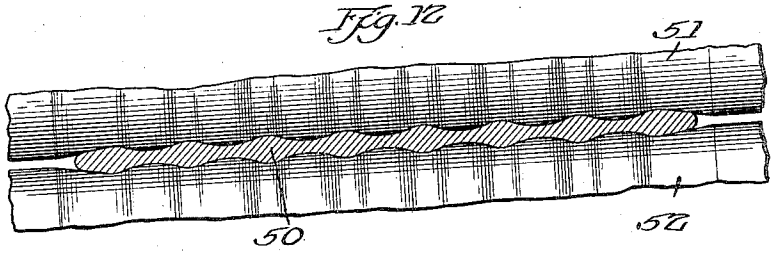


Fig. 13

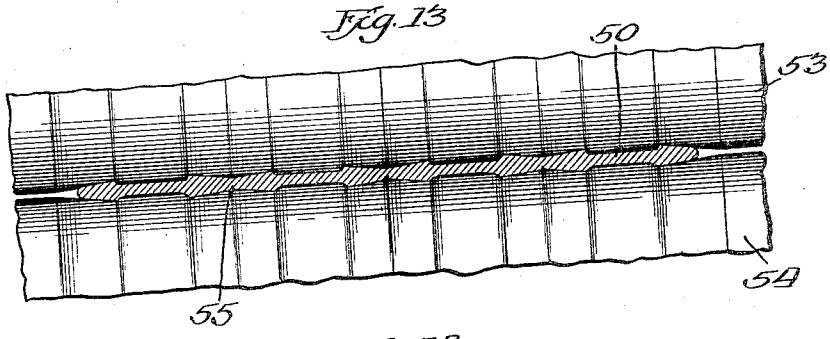
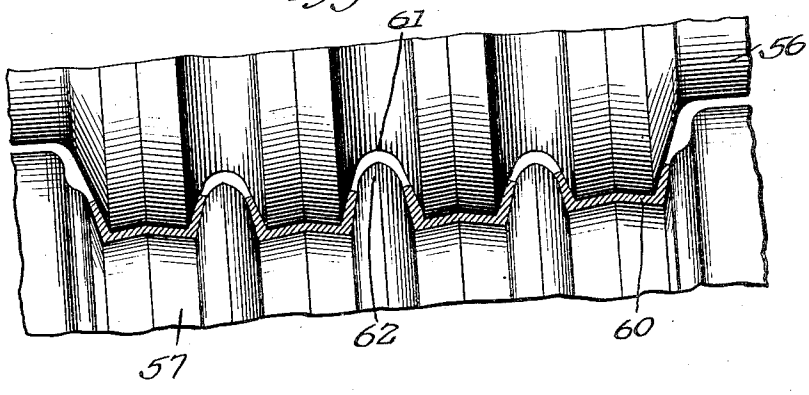


Fig. 14



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Patented Oct. 16, 1934

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UNITED STATES PATENT OFFICE

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METHOD OF ROLLING METAL SECTIONS IN MULTIPLE

Robert S. McCleery, Gary, Ind.

Application March 1, 1933, Serial No. 659,209

3 Claims. (Cl. 80—3)

The invention relates to a method of rolling metal sections of various shapes such as angles, T's or channels and has more particular reference to a method of rolling the sections in multiple and subsequently separating them into individual units.

Heretofore metal sections have been produced one at a time by passing a heated bar through a series of roll stands each having a pass of such design as to gradually decrease and shape the cross area of the bar until it finally obtains the desired sectional form. It is well known that the capacity of a mill depends on the speed of the rolls and the tables that carry the bars from one roll to the next and that consequently the capacity of the mill is directly proportional to the cross section or weight per foot of the single section produced.

The method of rolling contemplated by the invention does not involve any change in the general design of the mill but only in the roll passes so that a multiple of two or more units are formed at the same time from a bar of correspondingly larger size, the units being joined together by a decreasingly small area of metal. In the final pass the sections are separated into individual units by means of rolls arranged to shear the thin web of metal joining the sections.

Therefore, an object of the invention resides in the provision of a method of rolling metal sections which will produce the sections in multiples of two or more units and which will separate the sections by shearing the thin web of metal joining the same, producing a plurality of units for one rolling operation to thereby materially increase the capacity of the mill.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts—

Figures 1 and 2 are fragmentary elevational views of rolls having passes designed to initially shape the metal bar and to size the same to correct width;

Figures 3 and 4 are similar views of additional rolls provided with passes for further shaping the bar to form a multiple of angle sections;

Figure 5 is a view showing rolls having passes similar to Figure 4 with the passes, however, being offset alternately to cause separation of the sections;

Figures 6 to 9 inclusive are elevational views of rolls having passes designed for shaping squares;

Figure 10 is an elevational view showing rolls having square passes similar to those of Figure 9 with the passes, however, being offset to separate the square sections;

Figure 11 is an elevational view of rolls equipped with passes designed for rolling alternate square and round sections in multiple;

Figures 12 and 13 show rolls in elevation having passes designed for initially shaping a bar preparatory to the rolling of channel shapes, and

Figure 14 is an elevational view showing rolls with passes designed for simultaneously shaping the formed bar and separating the channel sections thus shaped.

The invention has been illustrated in connection with the rolling of angle, square and channel shapes only because these are the more common sections. Other shapes such as T's, rounds or sections of oblong cross area can also be rolled in multiple securing the advantages and benefits of the invention and which further permit of separation according to the invention, as will more clearly appear from the following description.

Referring to Figures 1 and 2 a bar 10 of a length determined by the length of the ultimate product is initially shaped by the rolls 11 and 12 and then passed through the sizing rolls 13 and 14 to bring the bar to correct width. For receiving the bar thus formed are two stands of forming rolls having the co-operating rolls 15, 16 and 17, 18, respectively, designed for further reducing the bar in thickness, while simultaneously shaping the bar, the passes in the latter rolls completing the shaping operation and producing a plurality of angle sections 20 from a single bar, the shapes being connected by a thin web of metal 21 to be ultimately severed to separate the units.

This last operation is accomplished by the roll stands having rolls 22 and 23 with their passes offset alternately to cause a shearing of the metal joining the sections thereby separating them. In actual practice the formation of the bar 10 into angles 20 is accomplished with the bar 10 at a high temperature to facilitate the rolling and shaping which takes place successively until the sections in multiple are discharged from the rolls of Figure 4. Generally the metal is thereafter allowed to cool, the product being stored in any suitable manner until convenient to separate it by the rolls of Figure 5. The operation to separate the sections is preferably done upon the cold product although the method is not to be limited in this manner as hot rolling of the bar may be continued to include the separation of the sections. When every step of the method takes place successively as in hot rolling the stacking of the products in the interim between the final shaping and separating in order to al-

low the same to cool is thus eliminated. However, since the sections leaving the last forming stand are in multiple they can be handled very easily and stacked without materially adding to the labor costs of the product and further the separating of the sections while cold is desirable as the shearing of the metal is accomplished without elongation and also since a fairly smooth severed edge results.

Figures 6 to 9 inclusive illustrate the various steps of the present method as applied to the rolling of square shapes. A bar 30 of the desired width and thickness is first corrugated on its upper and lower surface by rolls 31 and 32 and then reduced in width by the sizing rolls 33 and 34 of Figure 7. Further rolling operations are accomplished by the stands of Figures 8 and 9, the latter having passes designed to complete the shaping of the sections 38 into substantially perfect squares.

Referring to Figure 10 it will be seen that the step in the method of separating the sections by offsetting the passes in the rolls is repeated with respect to the square sections, the rolls 40 and 41 having their passes offset to shear the thin metal web 42. The bars taken from this stand are therefore completely separated from their adjacent units and may either be hot or cold depending on whether the shearing operation was conducted as a continuation of the hot rolling of the bars in multiple or whether the connected sections were allowed to cool before their separation.

The above rolling operations are in practice repeated to roll alternate square and round sections 44 and 45, respectively, as illustrated in Figure 11. The roll passes are of course modified in order to adapt the stands to the rolling of different shapes. When the round and square sections are rolled in multiple thin webs of metal 46 join the sections which are sheared by offsetting the passes in the succeeding roll in the same manner as already described.

In Figures 12, 13 and 14 the rolling method illustrated differs somewhat from that previously described since the sections are simultaneously separated and given their final shape, both operations being performed by a single roll stand. Initially forming rolls 51 and 52 shape the bar 50, giving the same a wavy upper and lower surface which is taken by the next rolls 53 and 54 and further shaped in cross section, the reduction of the metal at points 55 being accentuated to provide thin webs to facilitate separation of the shapes.

In Figure 14 the rolls 56 and 57 are designed with passes in the form of channels 60 to give that shape to the preformed portions of bar 50. The curved recesses 61 in roll 56 cooperate with the annular projection 62 on roll 57 to sever the bar 50 along the reduced points 55. This shearing of the metal at these points together with the rolling of the body portion of the channel 60 results in the desired elongation of the legs of the channel.

A feature of the present rolling method as applied to the rolling of channel shapes resides in the forming of the sections directly from the preformed flat bar 50 and without any intermediate shaping operation. This is necessary in order that the annular projections 62 may include a body of metal large enough to withstand the stress and strain of the rolling operation and also the intense heat to which these portions of the roll are subjected. As the connected sections of bar 50 are separated by the particular design of the passes of rolls 56 and 57 it is to be noted that the thicker portions between the center and extremities of the connected sections locate in a manner to form the angle joining the body of the channel to the outer legs. The outside sections formed by the rolls are allowed to come to place last in order that the outer legs of these sections may locate otherwise the sections would be drawn inwardly to the center of the roll producing outer legs on these sections considerably shorter than those produced by the passes centrally of the roll. For this purpose it has been found desirable to offset the inner roll passes and particularly those immediately adjacent the outside passes. In other words, the web diameter of the inner passes of the top roll are made larger in relation to the web diameter of the outer passes. The purpose of increasing the diameter of the web of the inner passes is to start the metal presented to said passes into place just a little in advance of the portions of metal presented to the outer passes. This action tilts the outer sections upward, an equal amount, to the web of the outer passes. By this time the sections are separated and are free to go to place in their respective passes, with the result that the outer sections are centrally located in their passes and the outer portions of metal thereof are rolled to produce legs of proper and uniform length.

It is to be understood that I do not wish to be limited by the exact embodiment of the device shown, which is merely by way of illustration and not limitation, as various and other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

I claim:

1. The method of forming channel sections from a metal bar such as a billet, which comprises shaping the bar to form connected sections of varying thickness while maintaining the major portions of metal in said sections in the same plane, and finally severing the bar at intervals throughout its length and simultaneously shaping the separated sections into forms having the metal thereof distributed to lie in several planes at an angle to each other.

2. The method of forming channel sections from a metal bar such as a billet, which comprises shaping the bar to give the top and bottom surfaces thereof a wavy outline when viewed transversely, further shaping the bar to form connected sections of varying thickness while maintaining the major portion of metal in said sections in the same plane, and finally severing the bar at intervals to separate the sections and simultaneously therewith shaping the separated sections into channel form.

3. The method of forming channel sections from a metal bar such as a billet, which comprises shaping the bar to give the top and bottom surfaces thereof a wavy outline when viewed transversely, further shaping the bar to form connected sections of varying thickness while maintaining the major portion of metal in said sections in the same plane, and finally passing the shaped bar through rolls having passes of channel shape, for separating and seating the sections centrally of their respective passes and substantially simultaneously therewith, shaping the sections into channel form.

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